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PERFORMANCE FEEDBACK EFFECTS UNDER VARYING CONDITIONS

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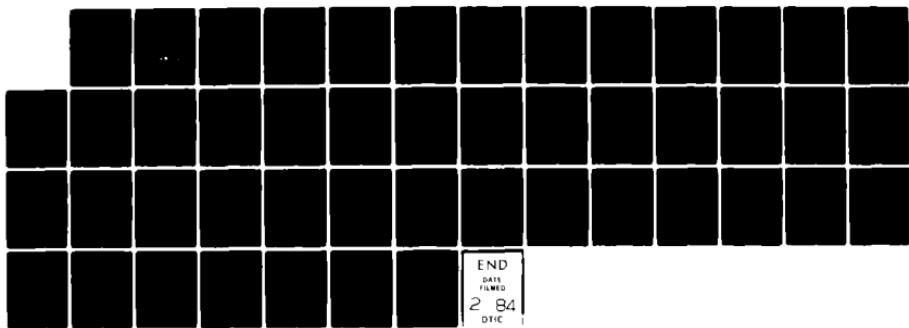
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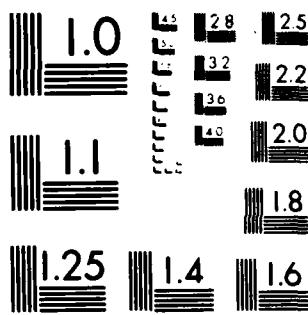
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Performance Feedback Effects Under Varying  
Conditions of Goals, Feedback Type, and Choice

by

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Prepared for  
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Three studies were conducted to investigate the effects of goal setting and feedback on quality and quantity performance dimensions of a task. The purpose of the research was to: (1) demonstrate the interactive effect of goals and feedback on performance, (2) investigate the effects of different types of feedback on motivation and learning in the presence of goals, and (3) explore the effects on motivation, learning and performance variables on allowing individuals the freedom to choose to receive feedback. In all three		

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experiments, subjects used a microcomputer to respond to a proofreading task. The results indicated that goal setting and feedback do interact to affect performance and that the cognitive processes involved in the interaction are more likely to be strategy-oriented rather than motivational.

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Performance Feedback Effects Under Varying  
Conditions of Goals, Feedback Type, and Choice

by

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Both goal setting and performance feedback have been shown to enhance performance in a wide variety of settings (Ammons, 1956; Ilgen, Fisher, & Taylor, 1979; Komaki, Barwick, & Scott, 1978; Latham & Yukl, 1975b; and Locke, Shaw, Saari, & Latham, 1981). Under most conditions, the existence of hard, specific goals clearly leads to higher performance than if goals are absent (Locke, et al., 1981). Likewise, performance can be increased by providing those working on a task with specific feedback about their level of performance (Ammons, 1956).

Although some have either argued or implied that the presence of goals alone (Locke, 1967) or feedback alone (Komaki, et al., 1978) is sufficient for enhancing performance, the more commonly accepted view is that goals are not effective unless they are paired with performance feedback (Becker, 1978; Erez, 1977; Strang, Lawrence, & Fowler, 1978). For example, in a laboratory setting, Erez (1977) found that goal level was related positively to performance on a clerical aptitude test only when the subjects were told how well they had performed relative to others working on the same task. When they did not receive such feedback, performance did not covary with goal level.

The view that feedback is a necessary condition for goal setting to have an effect on performance has been labeled the "interactive hypothesis" by Shaw, Locke, Bobko, and Beirzell (Reference Note 1). Most of the support for this theory has been indirect or post hoc. A case in point is the Erez (1977) study

in which post hoc analyses were used to explain why goal setting did not enhance performance for all participants. The one exception to the indirect support is the study conducted by Shaw, et al. (Reference Note 1). These authors crossed two goal levels (Hard/Specific Goals vs. Do Your Best Goals) with the presence or absence of feedback about performance on a questionnaire coding task. They observed an interaction effect between goal setting and feedback, and this interaction was replicated in a second experiment with the same task.

Two primary explanations exist for why goal setting and feedback interact to affect task behavior; to our knowledge, neither of them have been tested. The first explanation suggests that goals set performance standards, while feedback provides knowledge of results (KR) as to whether or not those standards have been met. Terborg (1977) discussed this process in terms of the development of performance strategies: when KR indicated that a goal has been met, it also implies that the method used in performing the task is acceptable. If, on the other hand, a person's behavior causes performance that KR indicates is inconsistent with the goal set (either too low or too high), the person is likely to alter his or her working strategies on the basis of that feedback in order to meet goal-directed standards.

A second explanation for the interaction effect involves intrinsic motivation (Mossholder, 1980). This theory says that when feedback is given in relation to goals it starts cognitive processes related to intrinsic motivation. Thus, if the goal is difficult, KR may lead people to feel challenged, and if KR indicates satisfactory performance, it may lead to a sense of accomplishment. Both of these feelings can occur even on relatively simple tasks, and are likely to increase intrinsic motivation. However, KR given in relation to assigned goals may also cause subjects to feel more controlled, thereby decreasing their intrinsic motivation. In accordance with this theory, Mossholder (1980) found that assigned

goals led to greater satisfaction with a non-intrinsically motivating task as defined by the Hackman and Oldham (1976) model of job enrichment, but that such goals decreased satisfaction with an interesting task. Similar conclusions can be drawn from the results of a simulation study of Umstot, Bell, and Mitchell (1976) and from Whyte's (1955) description of assembly line workers on piece-work pay systems who set goals to reduce boredom.

It is hypothesized that both KR and intrinsic motivation are processes which intervene between the reception of feedback and performance. That is, feedback affects KR and/or motivation, which in turn affects performance. The initial purpose of the first study reported here was to replicate the interaction effect between goal level and performance feedback. A second purpose was to explore the intervening processes of KR and motivation and their effects on performance.

In order to accomplish these purposes, a task was used that had more than one dimension of performance. Typically goal setting research has been limited to tasks or jobs where performance is measured almost exclusively in terms of quantity. For example, subjects in laboratory experiments of goal setting are often asked to solve anagram problems. They receive goals in terms of a number of anagrams to complete in a given time: that is, based on quantity dimensions. The quality dimension is a prerequisite for meeting quantity goals--either the scrambled letters of the anagram are rearranged into a word or they are not. Likewise, field studies have dealt with such factors as the number of trees planted (Latham and Yukl, 1975a) or number of pounds of logs loaded on a truck (Latham and Baldes, 1975), which represent quantity, not quality orientations.

Limiting the tasks to only one dimension has two drawbacks. First and more importantly, it limits the value of feedback for either strategy development or intrinsic motivation. Feedback on such tasks provides only the simplest type of

aid in strategy development; it tells the person to speed up but does not suggest techniques for doing the work more effectively. The feedback has meaning only when the person already knows what is needed on the task or when what is to be done is obvious to all. Quantity feedback limits variation in intrinsic motivation processes because the tasks for which quantity feedback is appropriate are generally quite simple. Finishing them is unlikely to lead to a sense of accomplishment.

A second limitation of goal setting research with only quantity goals is that such tasks represent a very small proportion of tasks normally encountered. It is much more common to be faced with a task that has both quality and quantity requirements and for these two performance criteria to be inversely related. Study 1 was undertaken to investigate the interaction effects of goal setting and feedback on KR, intrinsic motivation, and performance using a task that had both quality and quantity dimensions.

## STUDY 1

### Method of Study 1

#### Subjects

Sixty undergraduate students enrolled in a psychology class received class credit for participation in the study. In the course of the study, it became clear that two did not understand the instructions. They were replaced with two additional persons.

#### Design

Subjects were assigned randomly to conditions in a  $2 \times 2$  factorial design. Half of the subjects were given feedback about their performance and half were not. Within each of these two conditions, half of the subjects were assigned easy performance goals and half were assigned difficult ones.

#### Task.

The task involved proofreading nine paragraphs that averaged about 75 words

in length, with approximately two errors embedded in each. These errors included spelling, capitalization, subject-verb agreement, and verb tense. Each type of error was explained to subjects before they began the task.

The paragraphs were presented to subjects on a video display screen (12" green phosphorous ADM Information Display) connected to a micro-computer system (Cromemco Z-2D System 2). The paragraph was presented on the top one-half to two-thirds of the video screen with numerals printed on the far left of the display to identify the line numbers in the paragraph.

To respond to an error in the paragraph on the screen, the subject typed the line number on the keyboard in front of him or her and followed the number with a correction of the error. When the correction was completed, the person responded by pressing the "return" key on the keyboard. A question mark appeared on the screen after this response. If the subject wished to enter another error, the line number and corrected error were entered as described. If there were no more errors to record, the subject typed the response "no" followed by the return key. The next paragraph then appeared on the screen and the sequence was repeated until all nine paragraphs were completed. It should be noted here that there were some slight modifications in the task depending upon the nature of the feedback condition. These exceptions are described later.

#### Experimental Conditions

Goal Level. One of two goals with both a quality and quantity dimension were assigned to subjects. The quality dimension was a score determined by summing the number of correct scores identified and subtracting .25 times the number of incorrect identifications. Subjects in all conditions were given the same quality goal--a goal that pilot work had found to be moderately difficult. The goal was to attain a score of 15. Since not all subjects completed the task due to time

restrictions, this score was calculated after the subject had worked for 20 minutes--the least amount of time allowed for all subjects. The quality condition was held constant across goal conditions in this study; the goals varied only along a time dimension--that is, in a quantitative sense.

Half of the subjects were assigned difficult goals and half were assigned easy ones based on the amount of time they were given to proofread all nine paragraphs. Subjects in the hard goal conditions were asked to complete the task in 20 minutes and those in the easy goal were given 28 minutes. The time limits were based upon pilot work with the task that showed a mean performance of approximately 24 minutes and a standard deviation of about 4 minutes. A clock was placed in the room so a subject could self-monitor his or her time.

Performance Feedback. Two conditions of performance feedback were created--no feedback and feedback. Subjects in the no feedback condition were presented with the proofreading task exactly as it was described above. In the feedback condition, feedback on the nature of responses to errors in the paragraphs was administered at two different times. The first, termed "immediate feedback," appeared on the screen immediately after the subject identified an error in the paragraph. When the entry for an error was completed, the words "CORRECT" or "NOT AN ERROR" appeared on the screen depending upon the nature of the subject's response. The second form of feedback appeared at the end of the paragraph when the subject indicated that he or she could identify no more errors. At this point, four separate statements were presented on the screen providing subjects with a summary of their work up to that time. These statements included: 1) a listing of all of the errors that should have been found in the paragraph; 2) a running total of the performance score at that point in the experiment; 3) the length of time spent working on the paragraph; and 4) the amount of time the subject had

remaining to complete the task. The error summary was included because the immediate feedback which was triggered solely on the subject's response did not allow for knowledge about omissions. Omissions could only be identified after the subject had completed the whole paragraph because there was no requirement to go sequentially through the paragraph.

The summary feedback was left on the screen for 30 seconds to allow the subject time to study it. Then the next paragraph was automatically presented to the subject. Since the goals were in terms of time, at the completion of a paragraph in the no feedback condition, a 30 second delay was also built into that condition to equalize the time of the two procedures.

#### Procedure

Subjects were taken to the experimental room by the experimenter. The room contained a central area and two 6' x 7' cubicles attached to it. One cubicle was set up with a table and chair for completing paper-and-pencil instruments and the other with the computer system and monitor. All subjects were run individually. After a brief introduction to the study, a subject entered the cubicle with the table and chair to complete a standardized spelling test. Upon completion of this test, the subject was taken to the cubicle with the computer where the task was explained in detail and a practice proofreading task was completed. During training the experimenter was careful to explain all of the responses needed for the computer keyboard, the types of errors that would be encountered, and the nature of the feedback that would be received (for those in the feedback condition only).

It was at this time that the goal setting instructions were administered by the experimenter. Subjects assigned to the low goal condition were told that their goal was to obtain a passing score and complete all nine paragraphs in 24

minutes. Furthermore, it was pointed out that this was a relatively easy goal which most people who worked on this task had been able to accomplish. The hard goal subjects were told to complete all nine paragraphs in 20 minutes and that this was a difficult goal which many people could not meet.

The subjects then began to work on the task. At the end of the time allotted for the particular goal condition to which subjects had been assigned, the computer allowed subjects to complete the paragraph on which they were working, and then automatically presented a brief post-experiment questionnaire. Subjects were also informed of the time by the experimenter five minutes before the end of the proofreading task. After completing the questionnaire, subjects were debriefed on the purpose of the research.

#### Measures

Ability. General spelling ability was measured on a 56 word spelling test with nine misspelled words embedded in it. The words were randomly selected from a list of "355 Real Spelling Demons for College Students" (Furness & Boyd, 1959). The test took from three to seven minutes to complete.

Subjective Reports. Subjective reports were measured by presenting a series of items on the monitor after the completion of the proof-reading task. Subjects responded to each item by selecting the number of a preferred alternative and entering it on the keyboard. Only one item at a time appeared on the screen. As soon as an alternative was chosen, the next item appeared.

Seven variables were measured in this way. The first four were designed to measure the processes hypothesized to intervene between the experimental conditions and task performance. All used five Likert scale response alternatives with the low alternative "Strongly Disagree" and the high "Strongly Agree."

The first variable was Knowledge of Results. It consisted of 4 items designed to measure the extent to which the subjects believed they had had adequate knowledge

of how they were doing on the task. A sample item was, "I received frequent information about my performance on this task." The internal consistency reliability of this scale as well as all other scales and their intercorrelations appear in Table 1.

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Insert Table 1 about here  
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Control Over Task was the extent to which the subject felt in control of or controlled by the task. It was measured with 5 items, a sample of which is: "I felt as if I could have gone without the feedback."

In addition to those two custom-designed scales thirteen items were selected from the Job Diagnostic Survey (JDS) developed by Hackman and Oldham (1976). These items tapped five scales: experienced meaningfulness of the work, experienced responsibility for the work, knowledge of results, general satisfaction, and internal work motivation. The JDS Knowledge of Results Scale was highly correlated with the custom designed Knowledge of Results Scale ( $r = -.63$ ), and since the JDS scale contained only two items, it was decided that it should be excluded from further analyses. Scales measuring perceived meaningfulness of work and general satisfaction were also excluded because they were not sufficiently reliable. Finally, the Work subscale of the Job Descriptive Inventory (JDI Work) of Smith, Kendall, and Hulin (1969) was also used to index the degree of satisfaction with the nature of the work.

Performance. Two measures of performance were obtained--one reflecting quantity and the other quality. The quantity measure was simply the amount of time that the subject took to complete all nine paragraphs. For students who did not complete the task in the allotted time, this measure was estimated using their average time on earlier paragraphs in place of missing data. The time variable was

measured in minutes. The quality measure, termed "score at 20 minutes," was the subject's performance at the end of 20 minutes. The quality score was based on the number of correct items minus .25 times the number of incorrect ones. The twenty minute time period was selected because it represented a time at which all subjects were still working on the task. Since some did not finish the task, it was necessary to select a cut-off that allowed us to obtain a quality score that was equivalent for all subjects. Using the total score at the end of the nine paragraphs would have unfairly penalized those who had not completed the task.

#### Results of Study 1

Although goals varied only in the amount of time allowed for task completion, the effects of goal setting and feedback were investigated both with respect to the performance score at the end of twenty minutes and with respect to the total amount of time needed to complete nine paragraphs. A  $2 \times 2$  analysis of variance showed no significant effects for the experimental manipulations on the score at the end of 20 minutes. When total amount of time spent on the task was used as the dependent variable, however, main effects for both goal setting ( $F = 9.87$ ; d.f. 1, 96;  $p < .05$ ) and feedback ( $F = 4.48$ ; d.f. 1, 96;  $p < .05$ ) emerged. The interaction term was not significant ( $F = 0.92$ ; d.f. 1, 96;  $p$ , n.s.) in this analysis. Both goals and feedback affected the time variable in the direction predicted. Table 2 presents the cell means for these two variables along with all other relevant variables.

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Insert Table 2 about here  
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Of the two manipulated variables, the effect of goals was clearly stronger than that of feedback. The effect size statistic, Omega Squared, was .08 for goals and .03 for feedback. It was not surprising that goals had a stronger effect on time since goals were stated specifically in time units whereas the

feedback focused more upon knowledge about successful detection of proofreading errors. Also, the time component of the feedback was somewhat decreased in impact due to the presence of the clock in the room. What was surprising was the lack of an interaction effect. It was reasoned that this may have been due, in part, to the low power of the Analysis of Variance to test the predicted interaction. Shaw, et al. (Note 1) point out that the goal setting and feedback interaction is most appropriately tested with an a priori test comparing the high-high cell to the other three. Their rationale is the fact that the hypothesis states that performance will only be effective when both difficult goals are set and feedback is present. When the a priori test used by Shaw et al. was applied to the time to complete variable, the interaction was significant in the predicted direction ( $t = 3.36$ ; d.f. 39;  $p < .01$ ).

Two sets of analyses were run in order to examine the effects of process variables in this study. It was hypothesized that goal setting and feedback would impact on the process variables and they, in turn would affect performance. Thus, it was necessary to demonstrate that the treatments affected the processes and then to show that the processes, when held constant, eliminated the effects of treatments on performance. Of the five process variables, only two were effected by the treatments. These were Knowledge of Results and Control Over the Task (see Table 1). In this case, subjects believed that they had less KR when they received feedback and they felt more controlled by the task under conditions of feedback. The KR effect was more than likely due to the fact that the nature of the goals emphasized time whereas the feedback focused on quality of responses. Therefore, the goals lead to an increased concern about time, and the subjects may not have felt that they were getting appropriate feedback in spite of the fact that a clock was present in the room to provide the information they needed. The control results, on the other hand, supported the hypothesis of Ilgen, et al. (1979) which suggested that, in some situations, the presence of feedback may create a feeling of being controlled, which in turn could lead

to dissatisfaction with the task.

To investigate the second link in the intervening hypothesis, multiple regression analyses were run. For each process variable, the process variable, feedback and goal condition were entered in that order to predict time to complete the task. Since performance after 20 minutes was not predictable from the treatment conditions, it was not necessary to test for intervening processes using this variable; the hypothesis could not be supported given the absence of any main effects. The statistic of interest was the change in  $R^2$  due to feedback and goal condition after the effect of the process variable had been removed. Table 3 shows that for goal conditions, removal of the process variable had little or no effect. For feedback, only KR was first affected by the experimental conditions and then, when removed, affected the effects of the treatments on time to complete the task. Thus, the hypothesis received little support.

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Insert Table 3 about here

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#### Discussion of Study 1

Both performance feedback and goal difficulty had a significant effect on the time needed to complete the proofreading task when manipulated independently. Furthermore, an a priori interaction test comparing those who received both feedback and high goals to the rest of the sample, showed that the high goals and feedback group completed the task significantly more quickly than did those in the other three conditions. This replicated the interactive hypothesis of Shaw et al. (Reference Note 1).

The effect of goals and feedback on speed to complete the task is important for two reasons. First, time on the task was one of the two dimensions stressed by the goals. Therefore, responses in terms of speed indicated that the subjects

were aware of the task characteristics described as important to them. More interesting was the fact that subjects performed the task faster under the feedback condition with hard goals. This occurred in spite of the fact that to study the feedback took time. Time was built into the task so that those who received no feedback had a built-in delay after each paragraph equal to the amount of time that it took to get the summary feedback on the screen. However, if the subject were to study the feedback closely, any time spent doing this added to the total time to complete the task. In spite of this, those with feedback and hard goals performed the task more quickly.

Since quality goals were held constant across conditions, we did not expect goals to effect quality performance. Feedback, however, was hypothesized to effect the quality of performance and the measured psychological processes were expected to intervene between the experimentally manipulated variables and performance. None of these hypotheses were supported.

The most likely reason for the lack of feedback effects on the quality of proofreading seemed to be due to the nature of the abilities tapped by the task. Although we provided the people with information about grammatical errors and spelling errors after a particular paragraph, the information often was not of the type that they could use later. They simply learned that they were good or bad at the task. For example, by telling the person that they had made a spelling error, we may have provided information about their performance with respect to spelling, but if the same word did not appear again (which it did not) the information could not contribute much to improving spelling later on. It could only inform the person that the paragraphs contained spelling errors, but such cues were redundant with the initial instructions which described the types of errors that would appear in the paragraphs. Thus, it was concluded that the task was not

one that allowed for the type of improvement that was needed to investigate quality effects.

The general lack of a feedback effect on quality may also have led to the lack of evidence for an intervening effect the psychological variables between the experimental conditions and performance. The rationale for the intervening effects was more closely related to the quality of performance than to the quantity of it on a task such as this. For example, the feelings of accomplishment would seem to be more closely related to doing the job well than to completing it in a prescribed amount of time.

The absence of quality effects were of concern. Therefore, it was decided to run a second experiment modifying the task in the following manner. The first modification was to limit the research to the high goal condition. It was clear from the first study that the presence of feedback only had effects on performance under high goals. With low goals, there was no feedback effect. The second modification was to limit the errors in the paragraphs only to spelling errors and to present some of the words missed earlier in the task again in the later paragraphs. In this way, it would be possible to learn from the feedback and apply what was learned later on in the task. Such a change should increase the opportunity for feedback to impact on quality as well as quantity performance dimensions. Finally, the nature of the feedback was changed so that it was specifically focused toward quality, quantity, or both quality and quantity. It was hypothesized that feedback would have the greatest effect on the performance dimension to which it was specifically directed.

## STUDY 2

### Method

#### Subjects

One hundred thirty-two undergraduate students enrolled in an introductory psychology class participated in the study and received class credit for their

participation.

#### Design

Subjects were assigned randomly to one of four feedback conditions. These were: 1) no feedback, 2) quantity feedback (feedback about how fast they were completing the tasks), 3) quality feedback (feedback about their ability to identify and correct errors in the paragraphs to be proofed), and 4) both quality and quantity feedback. Due to the interpretation of the joint feedback condition, one-way analyses of variance with four levels were used instead of treating the design as a  $2 \times 2$  analysis of variance.

#### Task

The task was a modification of the proofreading task used in the first study. Nine paragraphs averaging 75 words in length were used. In this case all the errors in the paragraphs were limited to spelling. There were, on the average, five errors per paragraph, and nine of these errors occurred twice in the set of nine paragraphs.

Each paragraph appeared on the screen of the monitor with line numbers along the left-hand side of the paragraph as was described for Study 1. To respond to an error, the subject typed the line number in which the error appeared, and then entered the spelling of the word that he or she felt was correct followed by pressing the "return" key. A question mark then appeared on the screen. If the subject identified another error, the above process was repeated. If he or she felt that all of the errors had been found, the word "no" was entered, followed by the return key. At this point one of four feedback conditions occurred. After receiving feedback, subjects were instructed to type "1" and hit the return key when they were ready to go on to the next paragraph. This sequence was repeated until all nine paragraphs were completed.

### Experimental Conditions

Four conditions of performance feedback were created. For all four, the same performance goals were established. Specifically, each subject was asked to achieve a final score of 35 (based on the number of correctly identified misspellings minus .25 times the number of incorrect identifications) and to complete all nine paragraphs in 22.5 minutes. They were also told that this meant each paragraph should be completed in an average of 2.5 minutes in order to meet the goal. Pilot testing had shown that this was a difficult but attainable goal.

The four feedback conditions were: 1) no feedback, 2) quality only, 3) quantity only, and 4) quality and quantity. Subjects in the no feedback condition were presented with the proofreading task exactly as described. The quantity only feedback appeared on the screen immediately after the subjects indicated that they could identify no more errors in the paragraph. This feedback reported the amount of time that it had taken to complete the paragraph and also the average amount of time spent on each paragraph up to that point.

In the quality only condition, feedback on the nature of responses to errors in the paragraphs was administered at two different times. The first, termed "immediate feedback" appeared on the screen immediately after the subject identified an error in the paragraph. When the entry for an error was completed, the words "CORRECT" or "INCORRECT" appeared on the screen depending upon the subject's response. The second form of feedback came at the end of the paragraph when the subject indicated that he or she could identify no more errors. At this point, "summary feedback" appeared which included: 1) a list of the errors that should have been found in the paragraph along with their correct spelling, 2) the total number of correctly and incorrectly identified misspellings identified up to that point in the task, and 3) the subject's total score. This feedback condition

emphasized the quality component of the task by capitalizing the misspelled sections of words and their corrections in the following manner: "line 1: intelligAnce should be intelligEnce.

The quality and quantity condition combined the two types of feedback described above. Immediate feedback was provided during work on the paragraph. Summary feedback contained information about spelling errors, score and the time spent on the task.

#### Procedure

The procedure was nearly identical to Study 1. Subjects 1) reported individually to the experimental area, 2) were given a spelling ability test and an orientation to the proofreading task, 3) worked on the task, 4) were given another spelling test, and 5) were then debriefed and dismissed. Study 2 differed from Study 1 in the following ways: 1) students were not stopped once the time limit for the goal had been reached, thus allowing all subjects to complete all nine paragraphs, 2) no subjective measures were gathered in Study 2, and 3) subjects were asked to complete a second spelling test that was not used in Study 1 in order to gather information about learning and strategy development.

#### Measures

Ability. General spelling ability was measured by asking subjects to write the correct spellings of 26 misspelled words. The words were randomly selected from a list of "355 Real Spelling Demons for College Students" (Furness and Boyd, 1959). Subjects took from 5 to 10 minutes to complete the task.

Performance. Four performance measures were assessed. Two were similar to those used in Study 1. These were time taken to complete the task (time) and total score across all nine paragraphs. Time was simply to total time needed to complete all nine paragraphs. Total score consisted of the total number of

correct items minus .25 times the total number of incorrect words chosen by the subject. Since all subjects completed all nine paragraphs, there was no need to estimate missing time values or to use only those paragraphs completed at the end of a specific time period as had been the case in the first study.

Two other performance measures were designed specifically to tap the extent to which subjects learned from the qualitative feedback. The first of these, was labeled "Within-task learning". A subset of words was presented in the paragraphs on two occasions and misspelled both times. The subject's performance the second time the word appeared was used to reflect the extent to which he or she had learned from the first encounter with the word. The second measure, or "Post-task learning," concerned the same nine words. The words were imbedded in the list of words presented to subjects as a spelling examination after all proof-reading was completed. The correlation between within-task and post-task learning was high - .68.

Self-Esteem. A self-esteem scale (Rosenberg, 1965) was administered to the subjects after they completed the computer task. This scale consisted of ten items with which subjects were asked to agree or disagree using a four point Likert-type format. These items mainly measured the self-acceptance aspect of self-esteem, for example, "I feel I am a person of worth, at least on an equal basis with others."

#### Results of Study 2

The intercorrelations among the individual difference variables and measures of performance over the feedback conditions are reported in Table 4. With respect to individual differences, those with higher spelling ability scored higher on the total score and completed the task more quickly than did those with lower spelling ability. Self-esteem related to only one of the performance scores:

those with higher self-esteem also scored higher on the total score. This result is consistent with others' findings with respect to performance and self-esteem (e.g., Korman, 1971), and the fact that the self-esteem score did not correlate with spelling ability implies that the effect of self-esteem was more motivational than ability oriented.

---

Insert Table 4 about here

---

The intercorrelations of the performance measures indicated that the quality and quantity scores were inversely related for two of the three quality-oriented scores supporting our assumption about the nature of the task. For both learning measures the more the subject learned, the more time it took to complete the total set of nine paragraphs.

The effects of feedback were investigated using one-way analyses of variance and comparisons among specific feedback conditions. Table 5 reports the cell means and standard deviations for these analyses. To insure that subjects did not differ across conditions in ability or self-esteem, analyses of variance were run on the individual difference measures as well as performance. No differences among treatments existed on the individual difference measures.

---

Insert Table 5 about here

---

Three of the four performance variables were affected by the feedback conditions. The amount learned both within the task ( $F = 12.02$ , d.f. 3, 128;  $p < .001$ ;  $\Omega^2 = .20$ ) and outside the task ( $F = 8.07$ ; d.f. 3, 128;  $p < .001$ ;  $\Omega^2 = .14$ ) varied across conditions as hypothesized; the presence of quality feedback improved the quality of the subject's spelling performance both on words that appeared again in later paragraphs and on the spelling test taken at the end

of the experimental session. On the other hand, subjects who received quality feedback took significantly longer to complete the task than those who did not ( $F = 8.69$ ; d.f. 3, 128;  $p < .001$ ; Omega Squared = .15). Comparisons among cells showed that the quality feedback conditions were slower than either quantity alone or no feedback. The quality feedback condition was not significantly different from the no feedback condition.

#### Discussion of Study 2

The results offered partial support for the hypothesis that feedback directs attention toward goals and suggests strategies to use in meeting goals. When the task was structured so as to allow the subjects to learn from qualitative feedback, the quality of performance improved on two of three measures. When only quantity feedback was received, subjects were able to complete the task more quickly than they could when given either quality or quality and quantity feedback. This finding also supports the idea that quantity feedback directs attention to the quantity dimension of performance (time). However, this support is tempered by the fact that those who received no feedback at all finished the task just as quickly as those who were given quantity feedback.

The lack of a difference between the no feedback group and the quantity feedback group in terms of time to complete the task may have been due to the fact that, in the absence of feedback, the no feedback group members simply assumed that they were correctly detecting the spelling errors. If this were the case, their attempts to meet the assigned goals would have focused solely on the speed at which they completed the task. Such a focus would have led to completing the task more quickly than those who were also paying attention to correctly identifying spelling errors.

### STUDY 3

#### Purpose

The third study was designed to build upon the use of the proofreading task by allowing subjects to control the receipt of feedback. Allowing individuals the opportunity to select feedback was important for two reasons. First, the results of Study 1 indicated that useful feedback may also be perceived as controlling. Ilgen et al. (1979) suggested that this perception may decrease the positive motivational value of feedback. The behavior of selecting or not selecting feedback is also of interest in and of itself. If individuals in a work setting would seek out feedback about their own performance they could monitor their own progress toward work goals and modify their behavior in order to accomplish the goals.

Work by Weiss and his colleagues (Weiss & Nowicki, 1981; Rakestraw & Weiss, 1981) suggested that seeking information about one's own performance varies systematically across people. People who have high self-esteem are less likely to seek out information about their performance than are those whose self-esteem is low. Likewise, people who believe that they can influence their own performance are likely to gather information which help them to do so. Therefore, in the present study, it was hypothesized that high self-esteem individuals would seek performance feedback more often than low self-esteem and those who have an internal locus of control would seek it more frequently than those with an external locus of control.

#### Method of Study 3

#### Subjects

Ninety undergraduate students enrolled in an introductory psychology class completed both sections of the study and received class credit for participation. Two subjects were eliminated because they failed to attend one of the two experimental sessions; they were replaced with two additional subjects.

### Design

Subjects were randomly assigned to one of the three feedback conditions used in the second study. These were: quantity feedback, quality feedback, and both quality and quantity feedback. The design was treated as a one-way design with three levels of feedback.

### Task

With one exception, the task was identical to the one used in Study 2. The changes allowed subjects the option of choosing whether or not they wanted to receive feedback. Before each paragraph a question appeared on the screen which asked if the subject wanted feedback and indicated that a response of pushing the "1" key would provide feedback at the end of the paragraph whereas "2" would continue with the next paragraph.

### Experimental Conditions

Three feedback conditions were created. These were: quantity feedback, quality feedback, and quality and quantity feedback. The feedback received in each of these conditions was exactly the same as was provided in that condition in Study 2. Within each condition, the subject had the option of receiving or not receiving the feedback. Since subjects could self-select into a low or even no feedback condition because of the choice, the no feedback condition was not used.

### Procedure

Unlike the first two studies, Study 3 was divided into two sessions. The first was a group session in which 8 to 15 subjects were given a general introduction to the task, completed questionnaire measures, and signed up for the second session. The second session was conducted in much the same fashion as in the first two studies.

## Measures

Spelling ability, self-esteem, two measures of learning (within and outside the task) and the two performance measures of time and total score were used which were exactly the same as those used in the earlier studies. Two other measures were added. The first was Rotter's (1966) 28 item measure of locus of control. High scores on the scale indicate externality and low scores internality. The scale was administered during the first session. The second measure added was the number of times the subject elected to receive feedback.

## Results of Study 3

Of the individual difference variables assessed, only spelling ability and self-esteem correlated with measured behaviors. As was previously observed, higher ability subjects completed the task more quickly and, for total score, did better on the task (see Table 6). Also replicating Study 2, higher self-esteem subjects completed the task more quickly than did those with lower self-esteem. Neither self-esteem nor locus of control was related to the amount of feedback information chosen while working on the task.

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Insert Table 6 about here

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Two sets of data are of interest from the intercorrelations reported in Table 6. First the amount of feedback chosen correlated positively with two of the three quality performance measures. These were the amount learned within the task and the total score. Furthermore, it is of interest that choosing feedback was not correlated with the amount of time that it took to complete the nine paragraphs. Since receiving feedback did take additional time, the subjects who chose it must have compensated for the additional time by speeding up while working on the paragraphs themselves.

The second point of interest was the negative correlation between total score and time to complete the task. This result was not expected. The earlier study found quantity and quality to be inversely related. (The negative sign of the correlation is really a positive relationship between performance measures because lower time scores are better performance on the speed dimension.)

Table 7 presents the cell means for the variables of Study 3. Since spelling ability did differ by treatment condition, analyses of covariance were conducted on all other variables holding ability constant. In none of these analyses were the results different than they were without controlling for ability. Therefore, only the analyses of variance data were reported.

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Insert Table 7 about here

---

In general, the quality-oriented results of this study replicated those of Study 2. Although, in one case, amount learned was significant (Study 2) and in the other it was not (Study 3) and vice versa for total score, the patterns of all the means were very similar. Of most interest was the effect on time. Here quantity feedback lead to quicker completion of the task than did feedback with quality information replicating Study 2. However, those who received both quality and quantity feedback were significantly faster than were those who received only quality feedback, implying that the addition of quantity information allowed subjects to focus on both goals.

#### Overall Discussion

Past research on goal setting and performance feedback has tended to be limited to settings where the tasks or jobs were defined almost exclusively in terms of quantitative performance - number of anagrams completed, number of bags of trees planted, number of pounds of logs per truck, etc. Although this research

has demonstrated quite clearly the value of goal setting and feedback, a large number of tasks and jobs typically encountered in work settings do not allow for total concentration on quantitative output to the exclusion of qualitative considerations. In fact, typically, quality and quantity are inversely related. Thus, the present research extended the investigation of goal setting and feedback by dealing with a task that required consideration of both of these performance dimensions. On such tasks we looked closely at the interaction of goals and feedback, the development of performance strategies, the improvement in performance quality, and the behavior of choosing feedback when subjects could request or not request information about their past performance. Each of these topics will be addressed below.

#### Goal Setting x Feedback Interaction

When both feedback and goal setting were varied independently in the first study, only the combination of both feedback and goal setting lead to a significant improvement in performance over the other three conditions. This effect only occurred for time to complete the task; the effect was not significant for performance quality. As was explained earlier, the lack of a quality effect was most likely due to the salience of quantitative performance goals and the difficulty of making qualitative changes from the feedback given to subjects.

#### Strategy Development

The setting of hard, specific goals in combination with feedback may affect the development of performance strategies more than intervening motivational processes. The strategy development interpretation is consistent with previous goal setting research with quantity goals done in the laboratory (Terborg & Miller, 1978), the field, (Latham & Baldes, 1975), and in experimental simulations (Terborg, 1977). It is also consistent with expectancy or utility theory interpretations

of goal setting effects (Matsui, Okada, & Mazuguchi, 1981; Naylor & Ilgen, in press). Both these models assume that goals alter the cognitive belief structure of the task performer. In the case of expectancy/utility models, goals are thought to change expectancies that effort will lead to certain levels of performance and beliefs about the value of performance levels. In Terborg's more specific strategy development view (Terborg, 1977; Terborg & Miller, 1978), goals combined with feedback affect beliefs about what types of behaviors may be relevant for a specific task. In either case, the addition of feedback allows for strategy development by informing subjects about the appropriateness of past behaviors for meeting future performance goals. The strategy development interpretation is supported by the main effect on quantity (time to complete the task) in the first study where time was very salient and by the effects of feedback on the quality of performance in the second and third studies where quality was stressed.

#### Performance Quality

The second and third study demonstrated clearly that when performance feedback is designed to provide information that is useful for improving the quality of performance on the task, that feedback can impact positively on the quality of performance. In both studies at least one of the three measures of the quality of proofreading performance improved when information about performance quality was provided. In addition, there was a direct link between the level of performance on the quality dimension and the amount of quality feedback received by the subject in Study 3.

A second factor of interest with respect to performance quality and feedback was the fact that quality did not decrease when both quality and quantity feedback was provided. With the performance goals stressing both quality and quantity, it was thought that the presence of both types of feedback might make both performance dimensions more salient, and, because of the interdependence of quality and quantity

on this task, quality might suffer. This was not the case. Thus, it was encouraging to note that stressing both types of performance does not necessarily reduce performance quality.

#### Choice of Feedback

The choice of performance feedback was of interest both from the standpoint of the effect of choosing feedback on performance and from that of the conditions that influence the choice of performance feedback. With respect to the former, the data supported the conclusion that performance quality was influenced positively by the amount of feedback chosen. This conclusion is inferred from the positive correlation between the amount of feedback chosen and the amount learned within the task as well as the total score performance in Study 3. Although these are only correlational data and not capable of causal interpretation, the causal inference is strengthened by the experimental effect of feedback (presence vs absence) in Study 2.

With respect to possible influences on the choice of feedback, little information was gained. Neither the experimental conditions nor the individual difference variables of ability, self-esteem, or locus of control were related to feedback choice. This may have been due to the fact that the beneficial effects of checking spelling may not have been apparent to the subjects. If they believed that spelling performance was relatively fixed at any given time, then this belief may have influenced feedback choice. However, the fact that feedback was relatively frequently chosen (the mean choice represented choosing feedback on slightly more than half of the paragraphs) and that, when feedback was chosen, subjects reported being quite satisfied with it (Study 1), militates against this interpretation. Since performance feedback repeatedly is demonstrated to positively affect performance and since task performers are frequently in situations that allow for accessing or not accessing feedback, more work is needed to better understand the factors that influence the choice of feedback.

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Footnote

<sup>1</sup> Study 1 of this data set was reported in a separate technical report earlier. It was felt that a combination of it with the two additional studies offered a more complete treatment of the topic.

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Table 1

Intercorrelations of Experimental Conditions, Individual Difference Measures,  
 Perceptions of Task, and Responses to Task for Study 1 (N = 100)

	1	2	3	4	5	6	7	8	9	10
<b>Experimental Conditions</b>										
1) Goal	---									
2) Feedback	.00	----								
<b>Ability Measures</b>										
3) Spelling Ability	.10	-.22*	----							
<b>Perceptions of Task</b>										
4) Knowledge of Results	.05	-.87**	.02	(.84)						
5) Control over Task	.05	-.32**	-.22*	.36**	(.72)					
6) Responsibility for Task	-.04	-.08	.27*	.03	-.24*	(.60)				
7) Work Motivation	.15	.04	.23	-.08	-.27*	.49**	(.67)			
8) JDI Work	.08	.16	.15	-.22*	-.20*	.44**	.29*	(.67)		
<b>Responses to Task</b>										
9) Score at 20 Minutes	.13	.07	.31*	-.17	-.16	.14	.12	.04	----	
10) Time to Complete Task	-.30*	-.20*	-.10	.26*	.02	.16	.13	-.07	-.57**	----

\* p < .05 two-tailed

\*\* p < .01 two-tailed

Table 2  
 Means and Standard Deviations for the Effects of Treatment  
 Condition on the Measured Variables of Study 1.

Variables	Treatment Conditions					
	Low Goal No Feedback		High Goal Feedback		High Goal No Feedback	
	$\bar{x}$	s.d.	$\bar{x}$	s.d.	$\bar{x}$	s.d.
<b>Ability Measures</b>						
Spelling Ability	6.72	1.62	5.56	1.85	6.60	1.50
Perceptions of Task						
Knowledge of Results	3.49	0.51	1.66	0.58	3.65	0.58
Control Over Task	2.67	0.32	2.30	0.60	2.71	0.42
Responsibility for Task	5.11	0.93	5.17	0.98	5.24	0.84
Work Motivation	4.89	0.96	4.73	0.85	4.93	1.03
JDI Work	29.88	8.97	31.60	7.19	30.04	7.98
<b>Responses to Task</b>						
Score at 20 Minutes	13.92	4.87	14.50	4.56	15.00	3.42
Time to Complete Task	25.84	7.65	24.66	3.79	23.61	4.54

Table 3  
 Effects of Goals and Feedback on Time to Complete  
 Task with Process Variables Removed

Process Variable Removed	Change in R for Entering:	
	Feedback	Goals
None	.04*	.09**
Knowledge of Results	.00	.10**
Meaningfulness of Task	.04*	.08**
Control Over Task	.04*	.09**
Responsibility for Task	.05*	.08**
Satisfaction	.04*	.10**
Work Motivation	.04*	.10**
JDI Work	.04	.09**

\* $p < .05$

\*\* $p < .01$

Table 4  
 Intercorrelations of Individual Difference Measures  
 and Responses in Study 2 (N = 132)

	1	2	3	4	5	6
1. Spelling Ability						
2. Self-Esteem	.06					
3. Amount Learned						
Within Task	-.06					
4. Amount Learned						
Outside Task	-.06					
5. Total Score	.57**	.20*				
6. Time to Complete Task	-.31**	-.04	.33**	.20*	-.07	

\* p < .05

\*\* p < .01

Table 5  
Means and Standard Deviations for Feedback Conditions in Study 2 (N = 132)

Variable	Treatment Conditions			ANOVA Results			
	No Feedback	Quantity Only	Quality Only	Both Quantity and Quality	F	P-Level	Effect Size
Spelling Ability	19.30 (3.43)	18.94 (3.90)	18.60 (4.05)	19.48 (3.32)	.37	n.s.	---
Self-Esteem	32.18 (4.28)	32.67 (4.36)	33.00 (3.59)	32.88 (4.28)	.25	n.s.	---
Amount Learned	0.55 (0.79)	0.88 (0.78)	1.76 (1.06)	1.52 (1.03)	12.02	< .001	.20
Within Task	1.18 (0.92)	1.82 (0.77)	2.36 (1.34)	2.18 (1.10)	8.07	< .001	.14
Amount Learned	1.18 (0.92)	1.82 (0.77)	2.36 (1.34)	2.18 (1.10)	8.07	< .001	.14
Outside Task	30.67 (6.26)	29.48 (6.56)	31.82 (6.59)	32.86 (5.16)	1.83	n.s.	---
Total Score	21.19 (3.79)	20.06 (6.37)	26.48 (5.64)	24.35 (6.65)	8.69	< .001	.15

<sup>a</sup>Standard Deviation Within Cell

<sup>b</sup>Omega Squared

Table 6

## Intercorrelations of Individual Difference Measures and Responses in Study 3 (N = 90)

	1	2	3	4	5	6	7	8
1. Spelling Ability	---							
2. Self-Esteem	.11							
3. Locus of Control	-.02	-.32*						
4. Amount of Feedback Chosen	.19	-.07	-.01					
5. Amount Learned Within Task	.21	.08	.13	.35**				
6. Amount Learned Outside Task	.18	.20	.10	.20	.68**			
7. Total Score	.68**	-.06	-.07	.27*	.20	-.11		
8. Time to Complete Task	-.36**	-.33**	.07	.18	.01	-.24*	.03	---

\*p &lt; .05

\*\*p &lt; .01

Table 7

## Means and Standard Deviations for Feedback Conditions in Study 3 (N = 90)

Variable	Treatment Conditions			ANOVA Results		
	Quantity Only	Quantity Only	Both Quantity and Quality	F	P-Level	Effect Size <sup>b</sup>
Spelling Ability	17.40 (5.46) <sup>a</sup>	19.33 (3.53)	20.37 (2.82)	4.06	< .05	.06
Self-Esteem	33.00 (3.31)	33.27 (3.62)	32.27 (3.42)	.67	n.s.	---
Locus of Control	9.63 (3.26)	9.03 (3.61)	10.20 (4.94)	.64	n.s.	---
Amount Learned	1.03 (0.96)	1.70 (1.08)	1.67 (1.09)	3.84	< .05	.06
Within Task						---
Amount Learned	1.90 (1.47)	2.47 (1.28)	2.30 (1.51)	1.25	n.s.	---
Outside Task						---
Total Score	25.95 (7.96)	32.38 (4.77)	32.77 (5.37)	11.48	< .001	.19
Time	18.53 (4.38)	23.31 (7.21)	20.00 (3.75)	6.33	< .05	.11

<sup>a</sup>Standard Deviation Within Cell<sup>b</sup>Omega Squared

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